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PHI SIGMA SOCIETY

AN ORGANIZATION DEVOTED TO THE PROMOTION OF
INTEREST IN RESEARCH IN THE BIOLOGICAL SCIENCES
founded OHIO STATE UNIVERSITY, March 17, 1915.

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THE BIOLOGIST

VOLUME X NOVEMBER, 1928 NO. 2

The National Convention

THE convention will be held in New York, December 26 and 27, at Teachers College, Columbia University, 120 Street and Broadway, where all meetings of biological groups will be concentrated. Each chapter is entitled to one delegate or alternate who should be selected at once. Railroad fare will be paid and other expenses so far as our funds will permit. Payment will be made in advance. All money due the treasury before this time should be remitted; otherwise representation may be denied.

One day will be devoted to business and legislation; the other to a scientific program consisting in part of papers by active members which may be read by proxy or by title, attendance by the author not being required. However, the council reserves the right to reject any paper not representing original research work in which the author has at least participated. In addition, the council has decided to invite the presentation of research papers by junior investigators from any institution not supporting a chapter of Phi Sigma.

All titles, together with an abstract not exceeding two hundred words in length should have been reported to the secretary by November 15. The title, author's full name, institution, chapter, and address should accompany the abstract. In case the work has not been completed, the abstract may be submitted not later than December 1, but the other information should be submitted as early as possible in order to appear on the general program.

Headquarters for Phi Sigma selected by the local committee of the A.A.A.S. will be Hotel McAlpin, Thirty-fourth and Broadway. Transportation at door. Single without bath $2.75, with bath $4.00; double without bath $5.00, with bath $6.00 to $7.00. Reservations should be made at once. In case the chapter delegate has not yet been selected or is not likely to be selected for some time, the secretary should make reservation in his own name, later surrendering in favor of the delegate. This hotel will be headquarters for all zoological groups. The Lincoln Hotel, Eighth Avenue and Forty-fourth Street, will be headquarters for the botanical groups. Those members of Phi Sigma preparing to room here are at liberty to do so.

Delegates must be in attendance at all sessions.

Watch *Science* for further detailed preliminary announcements.

If you will co-operate by following these suggestions and instructions, you will greatly assist the officers who are giving their time to the work of Phi Sigma, and also assure better results in that work.

To the Chapters of Phi Sigma:

You have read the announcement of the next national convention to be held in New York City on December 26-27. If the plan for the program materializes, it will mark the beginning of a new and important step in the history of Phi Sigma. For the first time, an opportunity will be given to junior research students to present their results before a meeting of their own national body.

Another feature of the convention will be an address by an eminent scientist and teacher of biology. This address will probably take place following the dinner meeting. The man who has been selected as the speaker has won distinction through his work in a small college and is now on the staff of a great university. Such a range of experience should fit him to approach the problems of Phi Sigma in a peculiarly understanding way.

May I urge personally that no chapter miss the opportunity to be represented? Furthermore, may I second the very wise and necessary suggestions made by Dr. Reed in his recent circular to the chapters: diligence in chapter business will keep down the burden of it and keep the stage clear for our real task. That task, be it always remembered, is the encouragement of the spirit of research among young biologists.

Looking forward to the pleasure of meeting your representatives in a most successful convention, I am

Fraternally yours,

Paul B. Sears, *President.*

The following letter received by the National Council may be of interest to members of Phi Sigma:

''The Long Island Biological Association, through Director Reginald B. Harris, and the Station of Experimental Evolution, through Director Charles B. Davenport, have invited the Biologists of the American Association for the Advancement of Science and its Affiliated Societies, to spend Sunday, December thirtieth at Cold Spring Harbor, Long Island, in order to inspect these two interesting laboratories. Luncheon will be served to the guests.

''In planning such an excursion for your group, please do not forget that on Sunday afternoon the Philharmonic-Symphony Society is giving a special performance for the members of the meeting, and that on Sunday evening the Metropolitan Museum of Art has invited the members of the Association to a special reception. Trains leave Pennsylvania Station fairly regularly for Cold Spring Harbor, or if you prefer the local committee will be glad to arrange a bus service for you.''

Chapter Reports

BETA

University of Michigan

Since the last report of Beta Chapter went to press our affairs have sailed along serenely and under the able generalship of our genial President Dempster we are bringing to a close a year which has been singularly free from those petty squabbles with which all chapters usually have to contend. Moreover, the possibility of future bickering has been much reduced by a recent thorough revision of the chapter by-laws. In this revision we think we have sharpened up our definitions and regulations to a point which will materially reduce misinterpretations.

In matters biological, Beta Chapter has been most fortunate this spring in the fact that the University of Michigan has been the meeting place of a number of scientific societies, viz., The Michigan Academy of Science, Arts and Letters, The American Association of Anatomists, and The Federation of American Societies for Experimental Biology. This has presented our members a rare opportunity of hearing a multitude of excellent papers and of seeing many of the men whose names are held in awe and reverence by those of us who are but fledglings in the various branches of biological science. It is the earnest hope of the members of Beta Chapter that the members of Phi Sigma from other chapters who attended these meetings found their stay in Ann Arbor a pleasant one.

At the spring banquet which we have recently held we had the pleasure of initiating the following new members: L. E. Alexander, G. Bevelander, S. L. Diack, M. Hartman, H. W. Lovell, A. L. Nelson, G. L. Pattee, G. M. Plagens, P. V. Reid, and S. C. Whitlock. Beta Chapter is also very pleased to announce that Dr. G. Carl Huber, Head of the Department of Anatomy and Dean of the Graduate School, has honored us by accepting honorary membership in this chapter.

The spring banquet was further marked by the annual election of officers with the result that the reins of Beta have been placed in the hands of the following men for the coming year: R. Sutton, president; E. P. Creaser, vice president; C. L. Porter, corresponding secretary; M. H. Pike, recording secretary; M. C. Old, treasurer.

B. D. Thuma.

Papers read by members of Beta Chapter at the Nashville meeting of the A. A. A. S.

Little, C. C.—Opportunities for research in mammalian genetics.

Folger, H. T.—Acclimatization of tadpoles to methyl, ethyl and propyl alcohols.

——————Effects of chemicals on the reaction to light by tadpoles.

Hubbs, C. L. and Ortenburger, A. I.—Some results of the fish survey of Oklahoma.

La Rue, G. R. and Barone, G. H.—Studies on the trematode family Strigeidae (Holostomidae): Alaria oregonensis, n. sp.

La Rue, G. R. and Townsend, Elsie W.—Studies on the trematode family Strigeidae (Holostomidae): Alaria nasue, sp. nov.

La Rue, G. R. and Bosma, Nelli J.—Studies on the trematode family Strigeidae (Holostomidae), *Neodiplostonum lucidum* n. sp.

Welch, P. S. and Sehon, G. L.—The respiratory significance of the periodic vibratory movements in the larva of *Nymphula maculalis* (Lepidoptera).

Welch, P. S.—Metabolism of insects (Symposium on the physiology of insects).

Papers read by members of Beta Chapter at the meetings of the Michigan Academy of Science, Arts and Letters. March 29-31, 1928.

Section of Zoology

Creaser, E. P.—Notes on Phyllopod crustaceans, including a new species of *Apus* from China.

Dice, L. R.—The tint photometer employed for measuring the percentage of various colors in the coats of rodents.

——————Color correlations of mammals with habitats of white sand and black lava in New Mexico.

——————Attempts to breed cottontail rabbits in captivity.

Hubbs, C. L.—The successful transportation of the Japanese land-locked salmon to Michigan.

——————Two types of form-development in a single species of fish, the gizzard shad.

——————The high toxicity of nascent oxygen to aquatic animals.

——————The new species of black bass.

Little, C. C.—Preliminary note on a cross between *Mus musculus* and *Mus faroensis*.

Ruthven, A. G.—Old natural history books.

Schultz, L. P.—Latitudinal variation in the seasonal marks on the scales of the West American "smelt", *Atherinops affinis*.

Van Oosten, J.—Experimental investigations with different types of fishing gear in Lake Erie.

——————Resume of life-history investigations on the lake herring.

Welch, P. S. and Sehon, G. L.—The periodic vibratory movements of the larva of *Nymphula maculalis* (Lepidoptera) and their respiratory significance.

Section of Botany

Bartlett, H. H.—Notes on the flora of Sumatra.

——————Complete suppression of petals in a cross between two petaliferous *Oenotherae.*

——————Description of new Formosan species of Deutzia, Ligularia, Urtica and Viburnum.

Baxter, D. V.—Some poriae from the region of the Lake States.

Davis, B. M.—*Oenothera franciscana* and some of its sports.

Emerson, S. H.—Chromosome configuration at meiosis in a dwarf segregate *Oenothera "franciscana sulfurea".*

——————Multiple factor inheritance in a cross between *Oenothera grandiflora* and *Oenothera franciscana.*

La Rue, C. D.—The effect of environment on spore size in *Pestalozzia Guepini* Desm.

Robinove, J. J. and La Rue, C. D.—The hydrogen ion concentration of the habitats of bryophytes and pteridophytes of the Douglas Lake Region.

Sass, J. E.—Cytological studies on the bi-spored race of *Psalliota campestris.*

Schwartz, D.—Spore germination of *Lycoperdon pyriforme.*

Tupper, W. W. and Bartlett, H. H.—The anatomy of *Hevea brasiliensis* mut. *Granthami.*

Section of Geology and Mineralogy

Hussey, R. C.—Continental deposition in Michigan in the Cambrian.

——————Report of progress in the work on the Ozarkian and Cambrian of Michigan.

Senstius, M. W.—Weathering and soil formation in equatorial high altitudes.

Section of Forestry

Baxter, D. V.—Mycorrhiza and Scotch Pine.

Section of Psychology

Brown, C. R.—The meaning of scores in psychological and educational tests.

Ford, A.—The influence of marital responsibility upon labor turnover.

Thuma, B. D.—Preliminary report on the response of the albino rat to auditory stimuli.

Section of Sanitary and Medical Science

Lewis, H. B., Stearns G. and Chandler, J. P.—The non-protein sulphur of the blood.

McGinty, D. A.—Lactic acid in arterial and venous blood.

Papers read by members of Beta Chapter at the meeting of the American Association of Anatomists. April 5-7, 1928.

Gurdjian, E. S.—The connections of the hypothalamus. Do they bear out the experimental and clinical data on the tuber cinereum.

——————The hippocampus of the rat.

Papers read by members of Beta Chapter at the meetings of the Federation of American Societies for Experimental Biology. April 12-14, 1928.

Gesell, R.—Further observations on respiratory control.

——————An electrically driven long-roll kymograph with simplified features.

——————Oil displacement methods of recording volume flow of blood.

——————A quinhydrone electrode vessel and adapter and blood and tissue fluid collection tubes designed for CH determinations on small samples without loss of carbon dioxide.

Gesell, R. and Bean, J. W.—Electrical methods of recording pulmonary ventilation, blood pressure, heart rate, blood acidity and volume flow of blood designed to study effects of high oxygen pressure on a dog enclosed in a small compression chamber.

Gesell, R., Bernthal, T., Gorham, Grace, and Krueger, H.—Simultaneous observations on expired oxygen and carbon dioxide, blood acidity, blood flow, blood pressure, carbon dioxide capacity and lactic acid content of the blood with relation to pulmonary ventilation.

Bernthal, Theo.—Registration of volume flow of blood with the thermo-electric method.

Greeley, P. and Greeley, C.—Cerebral, head and body flow of blood during periodic ventilation.

McGinty, D. A.—Lactic acid metabolism of the circulated brain with volume flow measurements.

La Rue, G. R. and Vergeer, T.—An experimental investigation of the broad tapeworm in man.

Soule, M. H.—The interconvertibility of R and S bacterial types of bacillus paratyphosus B.

Read by Title

Gesell, R. and Hertzmann, A. B.—The acidity of the cerebrospinal fluid under a variety of conditions as related to respiratory control.

(Second Report)

Phi Sigma is the one society on the University of Michigan campus bringing together the younger research workers in the various departments. It serves a vital purpose for the beginning workers.

Although today Beta chapter is the oldest active organization in Phi Sigma, yet we have as many and as varied problems as those chapters just recently organized.

This year we have but a small nucleus of active members. This is due to the fact that too often, in the past, we have missed the Junior or Senior who needs the impetus and inspiration that Phi Sigma can afford. We believe that many of the chapters at the larger institutions will grant that this difficulty is vital.

Phi Sigma is fortunate in possessing a most capable National Council. Especially do we welcome Dr. A. I. Ortenburger (Beta 1919) as our new editor.

To date we have had two meetings, both being largely devoted to problems of organization. Beta chapter extends its greetings to members of Phi Sigma everywhere.

E. P. CREASER.

DELTA

University of Maine

(First report received April 24, 1928)

The past year has been marked by several changes in the chapter policies brought about by action of the chapter, and through faculty influence.

We held our spring initiation and banquet on March 15, which is an earlier date than in previous years, the purpose being to give new members a longer time in active service of the chapter before senior members become alumnae and cease to be active. At this banquet we were highly entertained by the original biologic poems of our ten student initiates. We are well pleased with the group selected. The program continued with an interesting and entertaining talk given by Dr. Karl Sax, Biologist at the Maine Experiment Station.

We now have twenty-five active members and twenty-five alumni, faculty, and honorary members. We have held meetings every three weeks, and at each meeting have been fortunate enough to have secured one of our faculty or experiment station workers to present a research problem. We expect, in the future, to have a student at every other meeting present a paper on some research which has been done. The chapter is of the opinion that research is out of line with undergraduate study because the student's time is all taken up in absorbing fundamentals; however, it is our purpose to stimulate interest in research by having recent work presented by experienced men and women. To create interest in research study, we will require each student initiate to present a paper on a research problem in his line of study on a scheduled date at a regular meeting.

Not only has our biology department been reorganized, but also it is being reconstructed. Coburn Hall, the Biology building has been almost entirely remodeled inside. It might be of general interest to state that the college of agriculture is expanding fully as rapidly as other institutions which make up the University of Maine. A new dairy building and milk house is nearly complete, a new head house and additional green house are under construction; and plans are under way for a Horticulture building and an Agronomy building.

D. B. LOVEJOY, *Secretary.*

(Second Report)

Delta Chapter has held two meetings and plans for the year are well under way.

This year we are requiring our initiates to present a paper to the society subsequent to their initiation.

Formerly we have drawn our speakers from our faculty, honorary, or alumni members. This year the active members will take over some of the meetings either presenting a paper or conducting debates. The topic of the first debate will be "Resolved that acquired characteristics can be inherited".

We have twenty-one new pledges, seven of whom are from the faculty or alumni. These pledges will be initiated November 22. The initiation will be followed by a banquet at Lucern-in-Maine.

Our Biology building has been completely renovated. On November 14 and 15 we held open house, issuing invitations to the faculty and students to inspect the building. Visitors at that time were given the opportunity to observe experiments which illustrated the various branches of biology.

This year we have lost two of our valuable honorary members, Dr. and Mrs. Karl Sax. Dr. Sax has accepted a position as assistant professor of cytology at Harvard.

Our delegate to the convention will be our president, Mr. Willis G. Nealley. We feel that he will ably represent our chapter and we, in turn, will be greatly benefited by the ideas he will bring back to us.

SADIE J. THOMPSON, *Secretary.*

EPSILON

University of Denver

New Members

Last June all but four of the active members of Epsilon were graduated, and as a consequence, we have been busy this fall getting new members whose scholarship average and interest in biological science qualified them for membership. We are indeed pleased that on November 14, we will initiate the following thirteen all of whom are active in the departments of Zoology, Botany, and Anthropology .

Dorothy Bowman
Helen T. Brown
William Butler
Raymond Fortner
Ethel Glandon
Solomon Kauvar
Dale King
Alice Newberry
Susanna Rogers
Martha Schroder
Mary Emily Starr
George L. Terwilliger
(A.B. University of Illinois)
Ruth Tureman

Speakers

This year the chapter voted to have meetings twice a month instead of just once as formerly. At our three meetings we have had most interesting speakers: Dr. J. M. Sherier, Head of the Rocky Mountain District Weather Forecasting Bureau, who described the ancient and modern methods of weather forecasting; Dr. E. B. Renaud, professor of Anthropology, who told about his recent trip to Europe; and Dr. Kahir S. Chouke, distinguished East Indian doctor, who discussed modern educational methods in India.

Phi Sigma Medal

Every year Epsilon conducts a contest for the best paper on a biological subject to promote an interest in scientific research. Every student in the University is eligible to compete for the beautiful little medal which is given for a prize. Last June two papers were judged to be equally good and two medals were presented on Insignia Day when all prizes, etc., at the University are awarded. Those who received them were John Martin, whose subject was "The History of the Sugar Beet Industry", and Katharine Bartlett who wrote on "The Nature and Distribution of Body Deformations among Primitive People". Arrangements are now being made for this year's contest, and we hope it will be as successful as the last.

Department of Anthropology

Some Phi Sigma members from this department spent a most profitable summer in travel and others are now engaged in interesting research.

European Research

Dr. E. B. Renaud, Head of the Department, traveled all summer in Europe where he carried on six different lines of activities:

At the Museums of Liege and Brussels in Belgium and at the British Museum and Museums of Salisbury and Ipswich in England he worked on Early European pottery.

At Carnac in Brittany and Stonehenge in England he made a thorough study of the Megalithic Monuments.

In East Anglia, England and in the Somme district of northeastern France he studied the correlation of the Prehistoric cultures with the glacial and river deposits.

To complete some previous work on Palaeolithic art he visited some caves of Northern Spain and the French Pyrenees.

In Dordogne, France he excavated in a Mousterian or Middle Old Stone Age site.

And lastly but not the least important, Dr. Renaud attended the meeting of the French Association for the Advancement of Science at La Rochelle as the official representatitve of the Archaeological Institute of America.

What's your Race?

Helen Brown and Katherine Bartlett are soon to start research in Physical Anthropology. They are preparing to take cranial measurements of 100 students to try to find the predominant racial type on the campus, based on the racial classification of Prof. Roland B. Dixon of Harvard.

A New Field School

So often in The Biologist we read of field schools in Biology, Zoology, or Botany, etc., but this summer two members of Epsilon went to a new variety. During the month of August, Frances Watkins and Katharine Bartlett attended the Field School in Archaeology conducted by the School of American Research of Santa Fe and the University of New Mexico, at Jemez Springs, New Mexico. The whole school of about sixty members camped out in tents for a glorious month. The camp was located about a quarter mile from a small Pueblo Indian ruin, which was partially excavated in a most scientific manner by the students, under the expert supervision of Dr. Edgar L. Hewett, veteran archaeologist.

Besides excavating work, five hours of lectures were given every day, on subjects relating to the work: the geology and physiography of the Jemez region; general Southwestern Archaeology; Indian religion; Pueblo Indian art; sketching of excavations; and a course in Comparative Cultures including a brief study of archaeology in Prehistoric Europe, the Mediterranean Area, Rome, Greece, and Palestine.

All the members of the faculty are authorities in their respective lines: Director Edgar L. Hewett, of the School of American Research; Dr. Ralph Van Deman Magoffin, President of the Archaeological Institute of America; Dr. Albert E. Jenks, University of Minnesota; Mr. Kenneth M. Chapman, authority on Indian Art in the School of American Research; Dr. Lewis B. Paton, Hartford Theological Seminary; and Dr. Hartley Burr Alexander, of the Scripps Colleges in California.

After the camp, the two Epsilon-ites went on a thousand mile tour of the Southwest conducted by Dr. Hewitt. They made a great circle trip from Santa Fe to Mesa Verde and back by way of Gallup, visiting all important archaeological sites and Indian villages such as Chaco Canon, Gran Quivera, Taos, Zuni, and Acoma.

ZETA

University of Wisconsin

Activities of Zeta Chapter for the new school year were initiated with a closed meeting on October 11. Many of the members had returned from very interesting summer activities in various types of biological work. Each spoke briefly of his experiences during the vacation months.

At the last initiation held by the chapter upon April 16, 1928, nineteen new members were taken into the organization. These men represented the departments of Agronomy, Bacteriology, Botany, Agricultural Chemistry, Genetics, Horticulture, Pharmacy, Soils, and Zoology, all being graduate students.

Programs of the meetings during the last semester of the past year consisted for the most part of reports of the researches of several members of the society. This semester staff members of several biological departments will discuss their special researches before the Phi Sigma meetings.

Professor H. E. Enders of Purdue University recently visited the University of Wisconsin to deliver an illustrated lecture, under the auspices of Phi Sigma, upon jungle life in the Panama Canal Zone.

Ralph M. Caldwell

LAMBDA

(First Report)

University of Montana

At a meeting of the chapter, April third, the following officers were elected: Kester Flock, President; Charles Rouse, Vice-President; Faye Couey, Secretary; Elmer Luer, Treasurer.

New initiates are: Mary Richardson, Leonard Brewer, Weldon Warner, Ann Kimbal, and Earl Carlton. At a banquet in honor of the new members, April tenth, Dr. R. R. Parker, of the state entomology laboratories of Hamilton, gave an interesting talk on ''Tularemia''.

Dr. M. J. Elrod, chairman of the Department of Biology, was recently elected President of the Inland Empire Education Association, and gave the opening address of that body, meeting in Spokane, Washington, April 4, 5, and 6.

Dr. Elrod, Dr. R. T. Young, and M. J. Harbaugh, conduct the park naturalist educational work in Glacier National Park during the summer. About 6500 people attended their lectures last season. Last year was the first for Dr. Young and for Harbaugh.

Drs. Kirkwood and Elrod are continuing, for the third year, their series of investigations into the teaching of science in northwest public high schools, and are fast accumulating large numbers of questionnaires.

Assistant professor J. W. Severy is collaborating with Biological Abstracts for Plant Physiology. Assistant Professor C. W. Waters has recently received his doctors degree from Michigan. His thesis, now in the press, is ''The Control of Uredinospore and Teliospore Formation by Experimental Methods''.

Alumni News

Sara Mershon and Mildred Clark are in Lansing working in the Michigan State Health Department laboratory.

Gertrude Pease is engaged in laboratory work at the Deaconess Hospital in Spokane, Washington.

Anna Beckwith is a senior in the nurse's training course at Johns Hopkins University in Baltimore.

Anne Maclay has a teaching fellowship in the department of Botany at Washington State college, Pullman, and is working for an M.A. degree.

Betty Custer is working for her M.A. degree at Berkeley, California, having an appointment under Dr. C. A. Kofoid in Zoology, and is doing work in Protozoology and Biochemistry.

Eloise Patten is a laboratory technician, holding down two jobs, one in St. John's hospital, Vancouver, Washington, and the other at Emanuel hospital, Portland, Oregon.

M. J. Harbaugh, formerly assistant in the biology department here, spent the summer in Glacier National Park, where he was park naturalist. He is now attending Johns Hopkins University where he has a teaching fellowship in biology. He will also work for his Ph.D. degree there, as he completed the work for his M.A. at the University here the past year.

Dorothy M. Behner married Oliver W. Holmes, September 14, at the Trinity church, New York City. Dorothy is now studying for her M.S. at the New York University, majoring in bacteriology, and is at the same time assisting in freshmen biology laboratories in the Washington Square branch of the N. Y. University.

Opal James married Dr. Paul G. Schmitt at the Trinity Evangelical church, Chatsworth, Illinois, July 22. Dr. Schmitt is resident pathologist and director of laboratories at the Cook County hospital, Chicago.

Grace Eldering is teaching at Hysham, Montana.

Helen Griffin is teaching science in the high school at Saco.

Elizabeth Kilroy is teaching in Butte, Monda Velikanje at Deer Lodge, Helen Carson at Helena, Adalouie McAllister at Sidney, and Rita Jahreiss at Spokane, Washington.

Robert Rea is an assistant commandant at the Massanutten Military Academy, Woodstock, Virginia.

Rex Speelman is high school instructor in General Science, Latin, Economics, and Biology at Newport, Washington.

ARNOLD WEDUM

(Second Report)

At our last initiation we added six new members to our chapter. At our initiation banquet Dr. R. R. Parker of the state entomology laboratories at Hamilton, gave an interesting talk on ''Tularamia''.

Our meetings have been going fine. We have an average attendance of about eighteen. For entertainment we have reports by students on research work which they are doing. There are quite a number of students doing research work this year.

Miss Mary Brown, '28, Botany, is doing work towards her M.A. degree on ''The Growth of Leaves on Nutrient Solution''.

Anne Kimball is doing an undergraduate problem in studying the development of the thyroid in the chick.

Helen Griffin is working for her M.A. on the ''Histological Effect of the Diet Deficiency Diseases on the Tissues of White Rats''.

Margaret MacLanahan is working on ''Celloidin Embedding of the Human Thyroid Gland''.

Arnold Wedum, in partial fulfillment of the requirements for an M.A., is beginning work tentatively to confirm the work of Ford and Abel of Johns Hopkins done in 1906 and 1908, on the toxin and glucoside hemolysis of the poisonous mushroom, Amanita phalloides.

Charles Rouse is completing an undergraduate problem on ''Seed Germination and Viability Tests of Native Forage Grasses of Montana and Idaho''.

Dr. Elrod and M. J. Harbaugh have been conducting the park naturalist educational work in Glacier National Park during the summer.

Dr. R. T. Young and the late Dr. J. E. Kirkwood have been at the Biological Station at Flathead Lake this summer, working for the Fish and Game Commission. They were working on the problem of why there are not more fish in the lake, with special reference to the Lake Superior Whitefish.

Miss Lucy Heathman (M.A., Kansas) is a new honorary member this year and is instructor in the bacteriology department. She is working on Entemeba Histolytica for her Doctor's thesis.

Miss Esther Larson, '25, (M.A. Washington University, Missouri), also a new honorary member, is an instructor in botany and is working on a classification for Composites for her Doctor's thesis. She has been at the Missouri Botanical Gardens, Washington University, St. Louis, Missouri.

Alumni News

Mary Brown, '28, (Bot.) is back working on her M.A.

Emma Raudabaugh, '28, (Biol.) has gone to Buffalo, N. Y., where she has the position of technician and instructor in bacteriology at the Deaconess Hospital.

Grace Eldering, '27, (Biol.) is in Lansing, Michigan, employed in a laboratory.

Charles Dobrovolny, '28, (Biol.) is teaching High School in Filer, Id.

Anne Maclay, '26, became the bride of Dr. Dana Leffingwell of Aurora, New York, at the home of her parents, Mr. and Mrs. Samuel Maclay of LoLo, Montana, in September. They are residing in Pullman, Washington, where Dr. Leffingwell is a member of the biology department faculty of the Washington State College.

Ruth Merrill, '28, (Biol.) and Ira Robert Alling, '27, were married at Sidney, Mont., August 11. They are making their home at Fairview, Mont., where Mr. Alling is managing editor of the Fairview News.

Mildred Clark, '27, (Biol.) has been placed in charge of the Port Huron Health Laboratories, Port Huron, Mich. Previous to this she has been working in the laboratories of the Michigan Department of Public Health.

Florence Anderson, '27, (Bot.) and Harry Stuber, '26, were married April 7. Their home is in Billings.

Fay Fouts, '27, is teaching in Sweetgrass. She worked this summer in a drug store.

Carl Beall, '26, (For.) is back again working on his M.A.

Ray Canfield '25, (For.) is doing experimental work in grazing at The Range Experiment Station in New Mexico.

Lew Matthews, '28, (For.) is at the Mandan Dry Land Experiment Station at Mandan, N. D.

John Emerson, '28, (For.) is under the U. S. D. A. Dry Land Experiment Station, Cheyenne, Wyoming.

Charles Bloom, '27, (For.) is a forest ranger at Plains, Montana.

Josephine Hinrichsen, '28, (Biol.) has a fellowship at Northwestern University.

Josephine Darlington, '28, (Bot.) has a fellowship at the Missouri Botanical Gardens, St. Louis, Mo.

Fred Lowe is teaching at Livingston, Montana.

FAYE COUEY

XI

University of Nebraska

Activities Centered Upon Research

Xi chapter has started out the year with fourteen active and twenty-six faculty members. Of the former, four are candidates for the bachelor's, seven for the master's, and three for the doctor's degree.

The officers chosen for the year are:

President	GEORGE HERZOG
Vice-president	KARL KOCH
Secretary	THEODORA KLOSE
Treasurer	ANTON FROLIK

Meetings are held the first and third Wednesdays of every month. They are usually well attended. During the past year programs have consisted largely of reports by student members on their research problems and summer biological experiences. However, we have also had several interesting talks by outside speakers and faculty members. The following list includes the lectures we have had since the last issue of THE BIOLOGIST.

Dr. Collins, Curator of the Museum, ''The Museum as a Factor in Biological Education.''

Leonard Worley of the Zoology Department, ''The Evaluation of the Sea.''

Theodore Steiger of the Botany Department, ''The Ecology of Marsh Birds.''

Milan Kopac of the Zoology Department, ''Demonstration of a Micro-Dissection Device and its Application to Research in Parasitology.''

Dr. Elda Walker of the Botany Department, ''The History, Aims, and Customs of Cornell University.''

Dr. R. H. Wolcott of the Zoology Department, ''Science, Culture, and Scholarship.''

Dr. E. H. Barbour of the Geology Department, ''The Early Geologic Forms of Nebraska as Exhibited by Excavations.''

Karl Koch of the Entomology Department, "The Transmission of Virus Diseases by Insects."

James Jensen of the Plant Pathology Department, "Diseases of Alfalfa."

George Herzog of the Zoology Department, "A Survey of Taxidermy."

Prof. L. F. Lindgren of the Bacteriology Department, "The History of Milk Improvement in the United States."

Sixteen new members were initiated into the organization last year. Thirteen more were elected to membership this fall and will be initiated at the semi-annual banquet scheduled for December fifth.

Summer Activities of Several Faculty and Student Members

By Theodora Klose

George Herzog, our president, spent the summer in the sandhills of Nebraska collecting and preparing zoological and botanical supplies.

Dr. D. D. Whitney spent six weeks at the Carnegie Station for Experimental Evolution, Cold Spring Harbor, New York. This time was spent in carrying on experiments on the male production in crowded and uncrowded cultures of the rotifer, *Hydatina senta.*

Mr. L. F. Lindgren took graduate work in Bacteriology and Human Pathology at the University of Chicago.

Dr. R. H. Wolcott was a member of the staff of the Puget Sound Marine Biological Station at Friday Harbor, Washington. Research on the shore mites of the region was carried on at the same time.

Dr. Otis Wade spent the latter part of the summer studying and collecting small mammals, mostly ground squirrels, in the Colorado Rockies.

Charles Whitfield carried on ecological research at the Alpine Laboratory, Manitou, Colorado.

Dr. H. W. Manter, spent the summer at Beaufort, North Carolina, U. S. Bureau of Fisheries Station, carrying on research on Trematode parasites of fishes. 303 fishes belonging to 50 different species were examined. 37 out of the 50 were found to contain trematodes. Ectoparasitic trematodes were found on the gills of 11 different species of fish. About 35 different kinds of trematodes were collected. Only about 12 of these have been well described. A paper dealing with these forms is underway.

James H. Jensen was stationed at Kearney, Nebraska during the summer. Here he conducted field observations in the study of causes of alfalfa failures.

Drs. L. B. and E. R. Walker spent two months of the summer in a trip to the Pacific coast. Collections of fungi, liverworts, mosses and ferns were made in the coast range of Oregon.

Dr. R. J. Pool spent the summer at Camp Olympus, Rocky Mountain National Park where part of the time was spent in teaching biology courses and part in research. Studies were made on the Ecological Composition of the Vegetation of the Alpine Meadows of the Rocky Mountains and also the Lichen flora of Rocky Mountain National Park.

THEODORA KLOSE.

Research Activities of Active Members

By RUTH DOROTHY SWARTZ

Anton Frolik—The vegetation of the upper Elkhorn valley of Nebraska, the largest prairie hay region in the state.

Theodora Klose—Plant Physiology: The quantitative determination of photosynthate by Dr. Long's picric acid method.

Helen Buttery—Ecology: Plant competition.

T. L. Steiger—Ecology: Ecological relations of the vegetation of the prairie region: measurement of the environmental factors and experimentation on distribution and quantity of vegetation as determined by quadrats, dry weights, photographs and various other ways.

Julia Joyce Harper—Mycology: Soil fungi with special emphasis on the Saprolegniales.

George A. Herzog—Parasitology: The Nematodes of Skunks.

Milan James Kopac—Parasitology: Attempting the artificial propagation of Trichina.

Karl Koch—Entomology and Plant Pathology: Transmission of virus disease of potato by aphids and other potato insects.

James H. Jensen—Plant Pathology: Observations on alfalfa wilt.

Joseph C. Reeves—Experimental Zoology: Eggs of Rotifera *Asplanchna amphora*.

Grace Kiernan—(Upsilon, Miami University)—A survey of the mammals of Lancaster County, Nebraska.

Harold H. Foster—Plant Pathology: Study of the physiologic forms of *Puccinia graminis tritici* found in Nebraska.

Ruth Dorothy Swartz—Experimental Zoology: Determination of the rate of metabolism of female producing mothers and male producing mothers of the Rotifera.

Alumni News

New Addresses

Leonard Worley (M.A. Nebr. 1928)—Fellowship in Zoology, Harvard University.

Elizabeth Hartman (Ph.D. Nebr. 1928)—Wilson College, Chambersburg, Pennsylvania.

Charles Whitfield (M.A. Nebr. 1928)—Carnegie Institution, Washington, D. C.

Clara Wolfanger (M.A. Nebr. 1928)—Biology staff, Hebron College, Hebron, Nebraska.

John Mack Winter (M.A. Nebr. 1928)—Department of Botany, Northwestern University, Evanston, Illinois.

Frank J. Schuett—Department of Zoology, Chicago University, Chicago, Illinois.

Samuel Rowley (M.A. Nebr. 1928)—Instructor in Biology, DeWitt, Nebraska.

SIGMA

University of Florida

Most of the members of Sigma Chapter are, in one way or another, making studies of the fauna and flora of Florida. Every man who has biological interests finds himself confronted daily by some new problem. His main difficulty lies not in finding one, but in choosing among so many tantalizing possibilities.

We of Florida lie in the dividing line between North Temperate and Tropical life. In the northern and western parts of the state we find the Beech, several Hickories, Yew, many of the northern Oaks, Hornbeam, Hop Hornbeam, Birch, Poplars and many another of the trees familiar to the northerner. With these trees is an undergrowth and animal life of similar northern character. As typical as is this life of a cool and temperate climate but a few hours auto journey takes the student into a country of Magnolia, Sweet Gum, Long Leaf Pine and Scrub Palmetto, of Cabbage Palm, Water Oaks, Tupelo and Cypress. Gradually the palms become more frequent as do the orchid fringes of the Oaks. Finally, below Tampa on the west coast and Palm Beach on the east we encounter the real tropics—the Everglades, great reaches of sunny marshland over which flows clear, fish-filled water with here and there an island of tropical hardwoods or Cabbage Palms. Here hundreds of Herons and Ibises feed or rise in great flocks. Panther, bear, deer and wildcat inhabit the islands, to say nothing of the more familiar small mammals.

Interesting as is the life on land from its beautiful species of palms to its rarest tropical insect the seas about Florida offer an even more fascinating study. There are coral reefs containing weird mollusks, crustaceans, odd echinoderms and various worms, beautiful jellyfish and schools of many colored, exotic fish. This seething, varied life flashes to and fro among dark coral caves past giant sea fans, sponges and intricately patterned corals. Students in the southern part of the state are able all the year round to go below in bathing suits and diving helmets to observe first hand the various forms mentioned in their texts. Occasionally some special treat is enjoyed, the sight of a Manatee or Sea-Cow, or a great Logger-head turtle laying its dozens of eggs on a moonlit beach.

The possibilities we of the Sigma Chapter find are wonderful but do not think that our work is necessarily easy. We are pioneers in many fields as will our successors be for many years to come. Scientific knowledge of Florida forms is woefully lacking. What little is known is to be found only in rare and scattered publications. The student of ecology must decide upon his own ecological divisions and determine their typical forms. The collector of insects must discover his own habitats and work out his own life histories. The student of marine life must invent and build his own collecting apparatus. It is fascinating, a great privilege—but work.

Perhaps the best proof of the work of the society lies in the collections and records of the individual members—results of many a long trip afield.

Below are the names of some of the members and their special work.

E. West—Fungi and Regional Herbarium Collections.

O. Van Hyning—Florida Reptiles.

L. W. Zeigler—Studies of local flora.

K. Williams—Bacteriology.

H. K. Wallace—Collection of local insects.

C. M. Hogan and Dr. Ahmann—Effect of the removal of the thymus gland on the brain.

P. D. Melvin—Embryology.

H. Mowry—Horticultural varieties.

E. T. Boardman—Tick list of the Gainesville region.

FACULTY AND OTHER MEMBERS

T. H. Hubbell—Orthoptera.

G. F. Weber—Plant Pathology.

G. B. Merrill—Study of the Coccidae.

C. R. Aschemeier—Habitat Studies of Florida Birds.

J. Gray—Insect Anatomy.

H. B. Sherman—Florida Mammals.

J. S. Rogers—Crane Flies.

E. T. Boardman.

UPSILON

Miami University

Near the close of last year's school term, a trip to Clifty Falls State Park in Indiana was sponsored by our chapter. A bus was chartered for a group of students and faculty members who were interested in biology, to make this 200 mile journey. The park proved to be an ideal spot for biological study. Every member of the party found the trip very profitable.

Among the research problems carried on last year by Phi Sigma members was one by Lottie E. Horn on human triplets. From her study she found that the triplets consisted of a pair of identical twins and a sister. In addition to her work on triplets, she studied another pair of twins and a younger sister showing that the relationship between the twins and younger sister was the same as that between the identical twins and sister in the triplets.

This fall Upsilon chapter has initiated two faculty members, Dr. Arthur T. Evans, head of the Botany Department, and Prof. M. W. Boesel of the Zoology Department. The following students were initiated: Mabel Wright, Ethel Phillips, Isabella Williams, Gerald Cheadle, B. Bernarr Vance, and Lester Myers.

HELEN DEETER, *Chapter Editor.*

PSI

University of Washington

Another chapter was added to the roll of Phi Sigma, when the Biological Society of the University of Washington was formally installed as Psi Chapter of Phi Sigma. The ceremony was held Saturday, April 7th, at the Wilsonian Hotel, Seattle. Professor J. E. Kirkwood, of the Botany Department of the University of Montana, acted as installing officer. He spoke of the purposes of Phi Sigma, emphasizing the encouragement of scientific research by Phi Sigma members, and outlining the policies of the organization for the maintenance of a strong and actively working chapter. Acceptance of membership for the chapter was made by Albert W. Snoke, President.

Following the ceremony a banquet was held for the chapter. Faculty members from various departments represented in the society were guests, as were representatives of other chapters who are now at the University of Washington. Those representing other chapters were Miss Katherine Wolfe, Xi chapter; Miss Helen Adams, Lambda chapter; Dr. Melville H. Hatch, Beta chapter; and Dr. Robert C. Miller, Mu chapter. At the conclusion of the banquet Dr. Kirkwood gave an address on, "The Pacific Element in the Rocky Mountain Flora".

The University of Washington Biological Society was organized in the fall of 1926 in order to further cooperation and fellowship among the biological workers at the University. The group consisted of about twenty members under the leadership of the following officers: Albert Snoke, president; Julia Goodsell, vice-president; Nina Le Neve, secretary; and Hebbel Hoff, treasurer. With Dr. R. C. Miller acting as advisor, the Society met regularly during the year. Programs at these meetings were composed of addresses on biological problems, by various outside speakers, and reports of their own work, by members of the society. In the spring of 1927 it was decided to petition for a charter as a chapter of Phi Sigma.

When school opened again in the fall, the Biological Society resumed activity. Officers were elected for the year, new members were brought into the Society, and the progress of the petition was watched with interest. The officers elected were Albert Snoke, president; Julia Goodsell, vice-president; Elizabeth McKay, secretary; and Hebbel Hoff, treasurer. In March, word was received of the acceptance of the petition and arrangements were made for the installation of the society as Psi chapter of Phi Sigma.

Psi chapter is at present composed of thirty-five charter members, drawn chiefly from the fields of botany, zoology, bacteriology, and physiology, with one member from the College of Fisheries and one member from paleobotany. The charter members are Rebecca Banks, Emmett Bodenberg, Katherine Chatterton, Florence Dean, Roy Fisk, Florence Folda, Julia Goodsell, Helen Hart, Lena Hartage, Joy Hirschman, Ebbe Hoff, Hebbel Hoff, Nina Le Neve, Ruth Lowrie, John Lucker, Elizabeth McKay, Marian Meaker, Marjorie Morgan, Keith O'Leary, Maude Rice, Floyd Schmoe, Beulah Snidow, Albert Snoke, Vera Stedman, Belle Stevens, Emma Jo Stewart, Ruth Swingle, Katherine Thompson, Randall Thompson, Seton Thompson, L. D. Van Tilborg, Wilma Warner, Helena Werby, Allan Weymouth, and Dorr Yeager.

Elizabeth McKay, *Secretary.*

OMEGA

University of Oklahoma

Installation of Omega Chapter of Phi Sigma took place March 24, 1928, at the home of Dr. and Mrs. A. I. Ortenburger, Norman, Oklahoma. Dr. C. I. Reed, National Secretary, from Baylor University, Dallas, Texas, read the ritual. Dr. P. B. Sears of the University of Oklahoma, National President, made a brief talk.

Following the installation a reception was given for the newly-initiated chapter by Miss Mary Jane Brown (Iota) and Dr. Ortenburger (Beta), who were active in forming the chapter here.

In the evening an initiation banquet was served in the Women's Building of the University in honor of Dr. Sears and Dr. Reed. Dr. Reed gave the address of the evening.

At the first meeting of the chapter, Rufus Moore was elected president; Herbert Warfel, vice-president; Kara Fullerton, treasurer; and Phyllis Draper, secretary.

At the last meeting of the year the following persons were initiated: Miss Dixie Young, Dr. J. M. Thuringer, and Donald B. Gould. Dr. Paul B. Sears, member of the Alpha Chapter, and Dr. A. I. Ortenburger, member of Beta Chapter, affiliated with this chapter. The departments at present represented in Omega Chapter are—Botany, Histology, Paleontology, Pharmacy, and Zoology.

The field spring meeting of the Oklahoma Academy of Science held in the Arbuckle Mountains was attended by several members of the chapter. Special song books of biological ditties were made by the chapter and given to everyone present.

Summer Activities of Members

The Oklahoma Biological Survey, headed by Dr. A. O. Weese and Dr. A. I. Ortenburger established a camp in the Wichita Mountains where they collected for four weeks. Following this, a reconnaissance survey was made of parts of northwestern Oklahoma. Ernest Raney, graduate assistant, and four zoology students were also members of the expedition.

Dr. R. E. Jeffs, the curator of the State Herbarium, assisted by Mr. Fred Barkley, made a collecting trip to the Oklahoma Panhandle during the early part of the summer.

The Rocky Mountain Biological Station at Gothic, Colorado, had as members of its faculty Drs. A. Richards, Mildred Richards and A. O. Weese. Herbert Warfel, Mary J. Brown, and Kara Fullerton studied there.

Miss Lois Gould spent the summer session studying under Dr. Aven Nelson at the University of Wyoming Camp in the Medicine Bow Mountains.

Rufus Moore and Aaron J. Sharp studied at the Biological Station of the University of Michigan, Douglas Lake, Michigan.

Research work is being carried on by the following graduate students: Miss Elizabeth Upshaw, the effects of X-Rays upon hereditary factors in mice; Miss Phyllis Draper, pollen analyses of Ohio peat bogs; Miss Lois Gould, phenology; Mr. Rufus Moore, essential oils in corn; Mr. Herbert Warfel, cytological study of growth in bee larvae; Mr. Aaron J. Sharp, mosses of Oklahoma.

PHYLLIS DRAPER.

ALPHA BETA

Mt. Union College

Alpha Beta chapter has held two meetings since its installation. The first regular meeting was held May 23, 1928. A very interesting paper was presented by Warren Wheeler, our president, on "Membrane Potentials of Living Cells." He was assisted by Carl Johnson in his experimental work.

The serious illness of Dr. J. M. Scott has deprived the organization of his loyal guidance of our activities.

The chapter is well represented in medical schools this year. Helen Kingsbury is attending Rochester Medical School, Joseph Gledhill—Western Reserve, Lee Koehler and Arthur Yengling—Harvard, and Carl Johnson—Johns Hopkins.

The members of Phi Sigma are interested in a number of research problems. The following is an account of the work being done by the various students.

Thelma Grimm and Hugh Crumay—The Phenold Coefficient of Hi-J.

Marguerite Scranton and Edna French—A Statistical Study of the Results of the Schick Test in the Alliance Public Schools.

Joseph Gledhill—A Study of *Councilmania lafleuri.*

Helen Kingsbury and Winifred Manchester—Comparison of Results of Meinicke and Wassermann Tests for Syphilis.

The material for our meetings is furnished by the students. A portion of the program is devoted to reviewing current biological literature, and to the reading of papers on research problems prepared by the students.

The scholarship of Phi Sigma is very high in comparison to other honorary societies on the campus. Half of Phi Sigma are members of Psi Kappa Omega, honorary scholarship fraternity.

Alpha Beta chapter is considering an increase in membership. A paper is required to be presented by each new member and this work is to represent the product of his own research.

GRACE A. MCCORD.

ALPHA ALPHA

University of Southern California

During the year 1922 certain advanced students in the biological sciences together with the professors in the University of Southern California organized the Biology Honor Society for the purpose of providing the opportunity of more intimate academic contacts between professors and students, thereby stimulating interest in the biological sciences. Election to the society was based entirely upon scholarship.

Desiring to extend the usefulness of the society, the members voted to petition the National Council of the Phi Sigma Society for the privilege of establishing a chapter at the University of Southern California. The petition was granted early in 1928 and the installation was arranged for May 12.

Dr. W. A. Setchell of the Department of Botany at the University of

California acted as installing officer. In the afternoon meeting of members only, the installation of the twenty-fifth chapter of the Phi Sigma Society was effected as the Alpha Alpha Chapter. The business meeting was followed by a formal reception and banquet attended by prominent Southern California scientists as guests of the organization. Approximately ninety people were present.

Dr. W. A. Setchell, the installing officer, an ecologist of distinction, presented a paper entitled "A Problem in Ecology" dealing with atoll and coral reef formation.

The Alpha Alpha Chapter, though new on the chapter roll, looks forward to an active career. The members feel that the privilege of affiliating with Phi Sigma will prove mutually helpful.

ALPHA GAMMA

University of South Dakota

Alpha Gamma Chapter of Phi Sigma was installed at the University of South Dakota, May 15, at 4:45 P.M. in the parlors of East Hall. Professor Don B. Whelan of the Department of Entomology, University of Nebraska, a member of Alpha Chapter, read the ritual.

In his installation remarks, Professor Whelan gave a brief history of the founding of Phi Sigma Society and the history up to the present time. The purpose and ideals of the society were given and advice to guide the new chapter as it changed from a local club to a chapter of Phi Sigma.

After the installation the members, pledges and guests assembled in Lewis Hall for a six o'clock banquet. Decorations were carried out in the colors of Phi Sigma, yellow, white and green. Place cards were decorated with Shasta daisies, the flower of the national organization.

The address of the evening was given by Professor Whelan. Leading up to his own research work on cutworms, Professor Whelan reviewed the researches of various members of the Departments of Entomology, Zoology, etc. at the University of Nebraska. He also outlined his project dealing with virgin prairies on which he has begun studies in animal ecology.

There were seventeen students and five faculty charter members. The officers of the new chapter are: John Dunn, President; Frank Forchtner, Vice-President; M. Elizabeth Abbott, Secretary; Mildred Voges, Treasurer.

All of the charter members very much appreciate the help given by Dr. Howard C. Abbott, Professor of Botany, and a charter member of Rho chapter, in organizing and guiding the Biology Club which now is Alpha Gamma Chapter of Phi Sigma.

Zeta Chapter of Phi Sigma

By Pettus Holmes Senn, *Chapter Editor*

The home of Zeta Chapter of Phi Sigma is at the University of Wisconsin, which is located in Madison, the capital city of the state.

In addition to regular university departments, several related state and federal organizations have headquarters and laboratories on the campus. These comprise the Wisconsin Geological and Natural History Survey, State Soils Laboratory in cooperation with the United States Bureau of Soils, United States Forest Products Laboratory, and the Wisconsin Agricultural Experiment Station, which operates three large experimental farms near the campus.

The Biological Division of the University is a unit in the organization of the Graduate School. It includes eighteen departments of the university, representing various phases of biological science.

Phi Sigma is a national honorary biological society and its membership at Wisconsin is drawn from among the promising young men who are undertaking graduate work in the various departments of the Biological Division, and who are actively engaged in some line of original research.

Paragraphs setting forth some of the features and advantages offered by the various departments in biological science, together with some mention of the various lines of investigation now being undertaken, are presented to the readers of The Biologist in the hope that they may be of interest to those located elsewhere, and enable them to glean some idea of the splendid equipment, advantages, surroundings, and cooperative spirit offered students doing graduate work and research in the various biological departments at the University of Wisconsin.

Agricultural Bacteriology

The Department of Agricultural Bacteriology is located in the west wing of Agricultural Hall and occupies a part of each of the four floors.

Prof. E. G. Hastings is Chairman of the department and is primarily interested in the work in dairy bacteriology. This work is located on the second floor where laboratories are available for formal course work and for research. The major research projects are concerned with the acid fast bacteria. Large quantities of tuberculin are prepared for use in the state. Lactic and ''eye-former'' cultures are also prepared and distributed.

Dr. W. H. Wright is also located on the second floor. He has charge of the undergraduate instructional work and also gives a course in Advanced Technic. Much of his research has been concerned with the development of methods. At present, he is devoting his time to a study of single cell cultures and the technic of securing single cell isolations.

Dr. W. D. Frost is in charge of the work in household and food bacteriology. His offices and laboratories are located on the third floor. The research work of this division for the last three years has centered largely on a study of the hemolytic streptococci occurring in milk.

Dr. E. B. Fred is in charge of the work on the second floor where research laboratories are provided for a study of industrial fermentations, e.g., the acetone-butyl alcohol, lactic, and propionic acid fermentations are being studied at present. Dr. W. H. Peterson of the Agricultural Chemistry Department is cooperating in this work.

The Soil Bacteriological work is also under the direction of Drs. Fred and Baldwin. The instructional and research laboratories of this phase of the work are located in the basement. The root nodule bacteria of the leguminous plants are being studied in detail.

Dr. I. L. Baldwin gives a course in the Physiology of Bacteria and is also located on the basement floor. His research is confined in the main to a study of the strain variations and the physiology of the root nodule bacteria of leguminous plants. In cooperation with Dr. Fred he is responsible for the preparation and distribution of cultures of these bacteria throughout the state. Some seventy to one hundred thousand cultures are distributed annually from this laboratory.

Agricultural Chemistry

Practically every young man connected with the Department of Agricultural Chemistry is an active member of Zeta Chapter. This year the department boasts of twelve Phi Sigma members, men who are members of the staff, as well as those who are assistants and fellows working for higher degrees. Most of these men are mainly interested in research, although some of them devote a part of their time to teaching. The department attracts many men of Phi Sigma caliber because it affords contact with men of repute in animal nutrition, plant nutrition, and fermentation chemistry, because it is housed in a spacious, well-equipped building; because it allows research with large domestic animals belonging to other departments in the school of Agriculture; and because of the cooperative plan with which the research is conducted, several men applying their individual abilities and experiences to a single problem.

A few of the most important pieces of research now in progress are as follows: Dr. Link, Mr. Dickson and Mr. Otterson, working in plant chemistry, are especially interested in the chemical composition of plants as related to physiological activities. Mr. Schrader and Mr. Kletzein are studying the chemical and physiological properties of ergasteral, the mother substance of Vitamin D. Mr. Thomas and Dr. Elmslie, industrial fellows, are following the activations of foods by ultra-violet light and the proper ratio of calcium and phosphorus in foods for maximum bone calcification. Dr. Waddell and Dr. Elvehjem have centered their interests in studying factors affecting iron assimilation and hemoglobin production, especially the importance of copper as a supplement to iron in the formation of hemoglobin. Mr. Lindow is completing a comprehensive study of the amount of manganese and copper in human foods. Mr. Gunderson's problem concerns Vitamin B, and Mr. Scott is studying the practical applications of the newer knowledge of calcium assimilation as well as the relation of the para-thyroids to calcium metabolism.

Agronomy

The Agronomy Department is one of the oldest departments in the College of Agriculture, and has always been a very important factor in the agriculture of the state. It was started in about 1900 under the leadership of Professor R. A. Moore who also developed the Short Course and the Experiment Association. The Experiment Association serves the important function of disseminating, direct from the experiment station, the improved varieties of pure grains among the farmers over the state. The department has concerned itself chiefly with grain improvement problems of the state.

The Agronomy Department is really a field crops division since it is separate and distinct from the Soils Department. For that reason most of the research is carried on cooperatively with the related departments, such as Soils, Plant Pathology and Genetics. The graduate students in the choice of their problems usually carry out the same plan of cooperation.

At the present time grain breeding studies are being carried on with barley, rye and wheat. A new variety of smooth awned, white, six-rowed barley has been created that is resistant to barley stripe. An effort is being made to breed a hard red winter wheat that is awnless and winter hardy. Sterility in rye has been attacked by inbreeding and selection of fertile strains that are disease resistant. Disease resistance has been sought for in all of the breeding work with the cooperation of the Plant Pathology Department. Efforts in corn breeding have been centered largely toward the production of a cold resistant variety that is capable of germinating and producing chlorophyll for a vigorous growth under cool spring conditions.

The improvement of pastures has also been given its share of attention.

Different pasture mixtures are being studied along with different methods of seeding and fertilization. The importance of time and frequency of cutting in relation to the root reserves and winter survival is being investigated.

Some research is being done on the problem of drying seed corn. A dryer has been constructed which forces a blast of hot air through the undried corn on the cobs. An effort is being made to determine the interrelations of temperature and length of time of drying to germination and disease.

Because of limited facilities, the graduate students majoring in Agronomy have found it necessary to do their research in the closely related fields as joint problems between two departments. Although the department has limited itself to field crops, some fundamental research has been done as a result of the excellent coöperation between the several departments. Among the problems being studied at present include pea breeding, breeding for disease resistance in corn, hybrid vigor in corn, rate of movement of phosphates in soils, and winter killing of winter wheat.

Animal Husbandry

The task of the Department of Animal Husbandry at the University of Wisconsin, as is the case at many other State Colleges of Agriculture, is threefold, consisting of extension work, resident instruction, and research work, and accordingly it is organized to facilitate the conduct of such a program.

The research work of the department is under the supervision of Dr. Gustav Bohstedt, formerly Chief of the Department of Animal Industry of the Ohio Agricultural Experiment Station. A large part of the time of many of the members of the staff is devoted to research along various lines.

The flocks and herds of livestock of the College are available for the study of various problems, as well as for class work and demonstration purposes. In addition there are maintained two separate herds of dairy cattle for the purpose of studying cooperatively with the Department of Agricultural Chemistry vital problems of nutrition. Added to these facilities, the Quaker Oats Company maintains a two hundred acre farm equipped for research work in the feeding of dairy and beef cattle, sheep and swine. This work is under the supervision of the Department of Animal Husbandry and is carried on by two members of the staff on an Industrial Fellowship basis.

The location of the College of Agriculture at the State University facilitates contact and cooperation of the department with other departments of the University, especially those of natural science.

One of the most extensive and practical projects is the study of the effect of nutrition upon the resistance of a dairy cow to contagious abortion. This is under the joint supervision of the departments of Agricultural Chemistry, Animal Husbandry, and Veterinary Science.

Through the Purnell Act of Congress, resources are available for an extensive study of the effect of the preparation of roughages for farm livestock.

The feeding value of oat feed, a by-product from the manufacture of oat cereals, is being studied at the farm maintained by the Quaker Oats Company.

Studies of the economy of beef production are in progress. Comparisons of linseed meal, cottonseed meal, and a mixture of the two as a protein supplement for fattening cattle are being made. The meat producing qualities of crossbred Aberdeen Angus and Holstein Friesian cattle is the subject of another line of resarch.

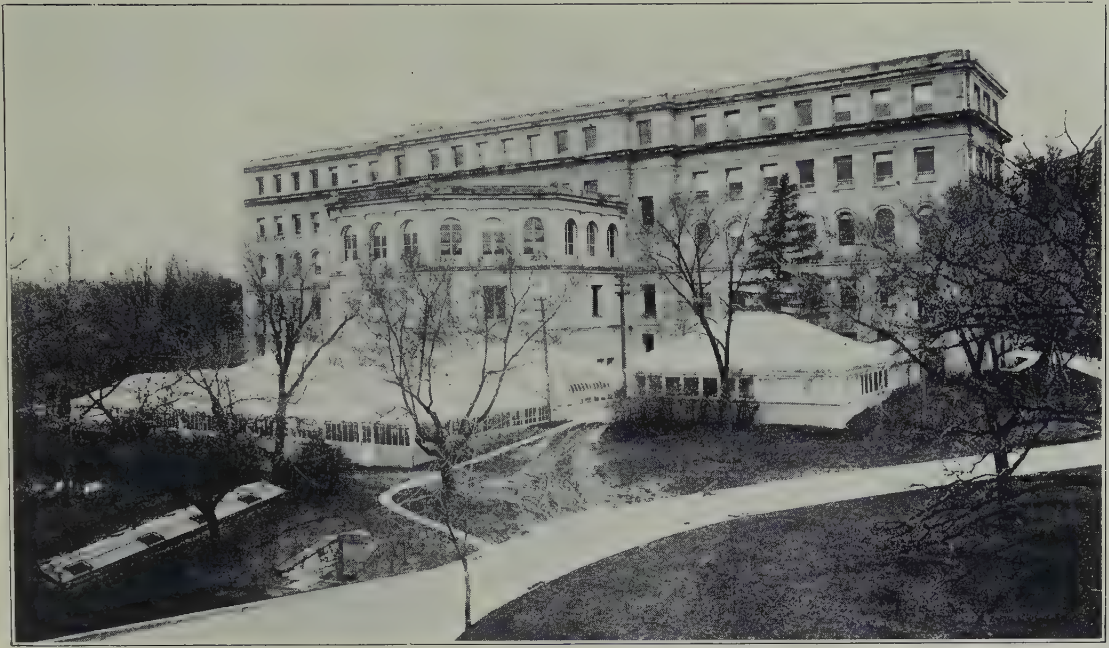
Wisconsin being a dairy state, much study is being given to the feeding and growing of dairy calves, an important problem to the dairy farmer who sells whole milk.

Some of the more important lines of investigation with swine are the studies of mineral supplements and pasture crops for swine. A study of the protein requirements of growing fattening pigs has recently been inaugurated.

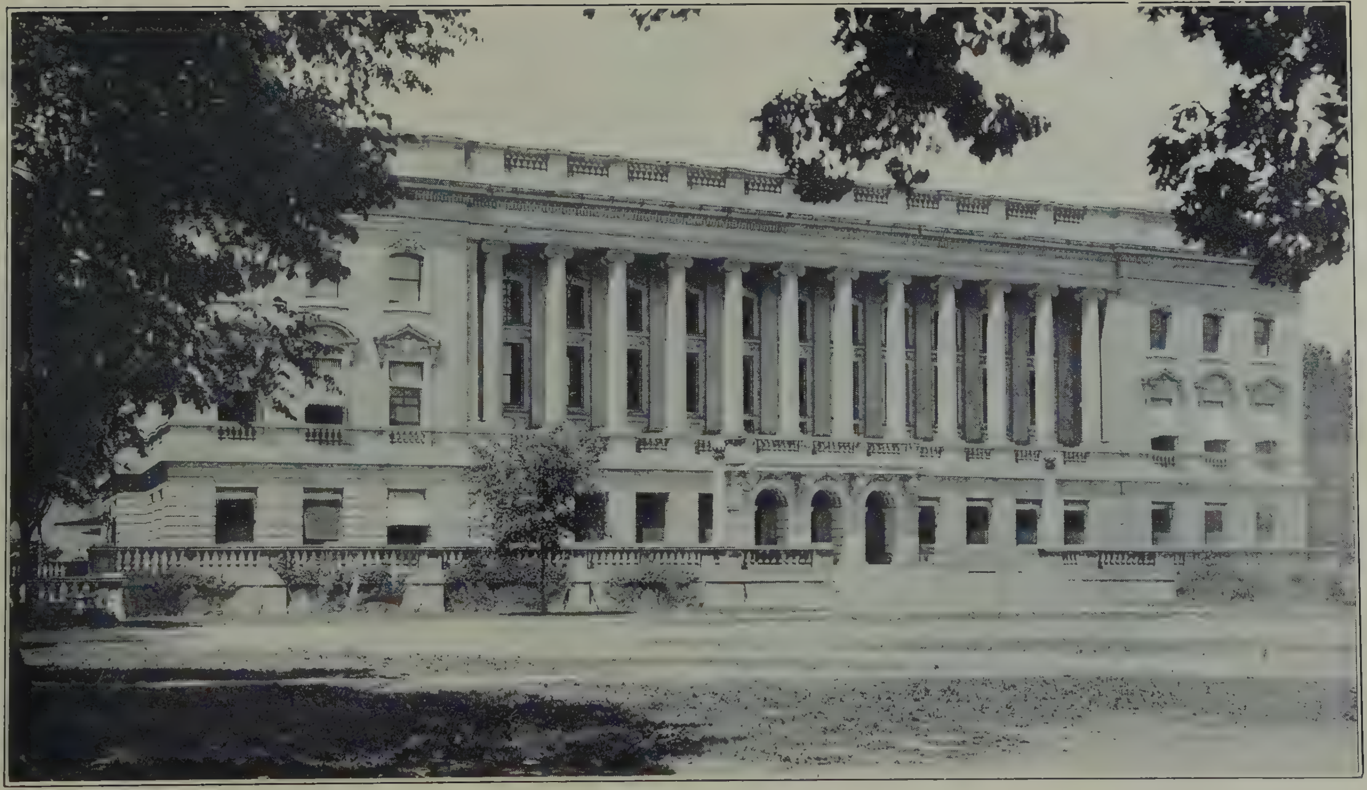
Botany

The department of botany occupies the west wing of the Biology Building which also houses the department of zoology. This building, erected in 1912, is a large six story stone structure well fitted for study and research. Besides many well lighted student and research laboratories, offices, museums, class rooms and lecture halls, the department is equipped with constant temperature chambers, refrigeration rooms, chart room, chemical rooms, store room and work shop. At the rear of the building is a series of five greenhouses directly connected with the plant physiology laboratories which are in the building proper. These furnish ample space for production of class room materials as well as for experimental work.

The instructional staff of the department of botany consists of thirteen members exclusive of ten half-time teaching assistants. The research of Dr. C. E. Allen is well known in the fields of cytology and genetics. He is at present continuing his study of the inheritance and cytology of Sphaerocarpus and directing studies mainly on liverworts and seed plants, which are being carried on by a number of his students. Dr. B. M. Duggar joined the department in 1927 coming from the Missouri Botanical Gardens. Dr. Duggar, widely known for work in the fields of physiology and plant pathology is now conducting investigations upon the nature of the tobacco mosaic virus. Phi Sigma claims Dr. Duggar as an honorary member from



BIOLOGY BUILDING—REAR VIEW
Greenhouses and Vivarium in Foreground



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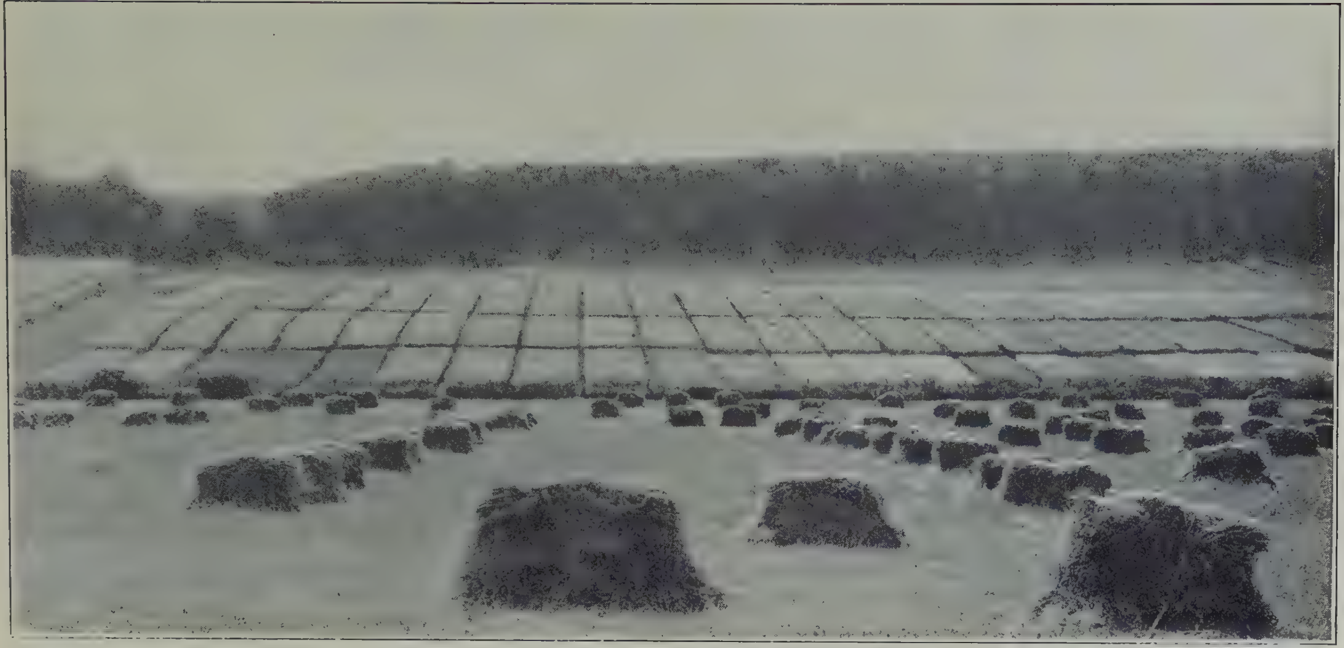


AGRICULTURAL EXPERIMENTAL PLOTS

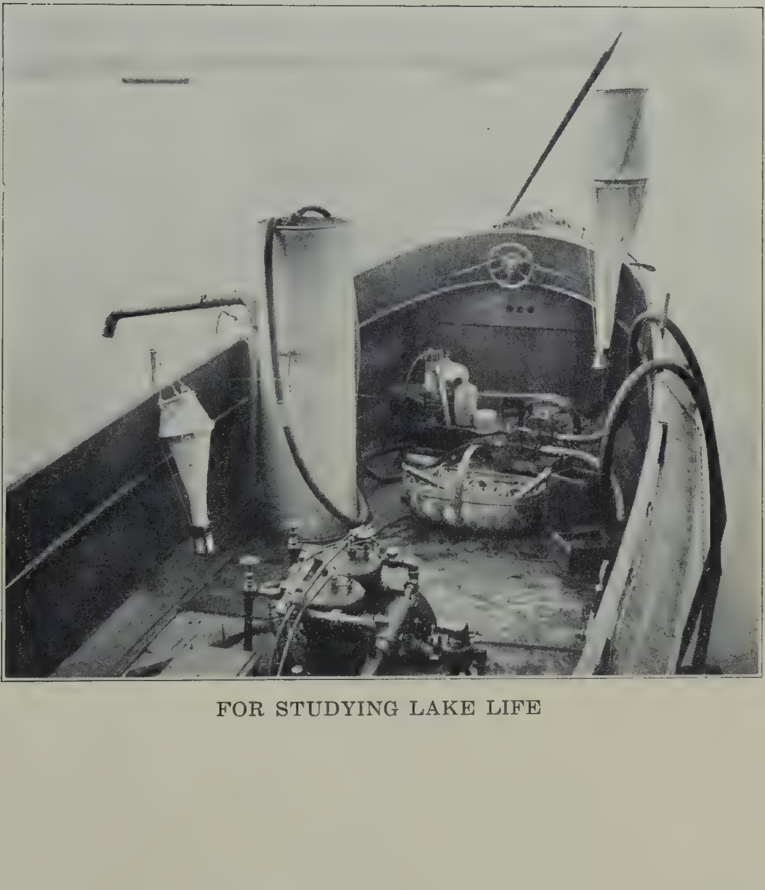
THE HENRY QUADRANGLE
Entrance to Agricultural College Campus

WHERE ZETA CHAPTER MEETS

THE APIARY

HALL OF HORTICULTURE
Horticulture and Plant Pathology Departments
are Located in this Building

SOILS BUILDING



FOR STUDYING LAKE LIFE

Iota Chapter. Dr. E. M. Gilbert, chairman of the department, is a charter member of Zeta Chapter of Phi Sigma. He has been one of the most enthusiastic Phi Sigma supporters among the faculty of the biological departments. The researches of Dr. Gilbert and his students are in the field of cytology of the fungi, particular attention having been given to the water molds. Dr. George S. Bryan has charge of the Botany I course in which 440 students are registered this semester. His research interests have been in the morphology of the bryophytes. Dr. Bryan is also an honorary member of Zeta Chapter. Dr. J. B. Overton is at present jointly affiliated with the Wisconsin Department of Botany and the Carnegie Plant Physiological Research Laboratories at Tucson, Arizona, and Carmel, California. He is continuing his studies upon sap flow in plants at these stations.

A total of thirty graduate students are taking their major work in the botany department this year. Courses in cytology, physiology, morphology in all the plant groups, histology and anatomy are given by the above mentioned professors associated with several other staff members of professorial rank. Drs. C. E. Allen, George S. Bryan, R. H. Denniston, E. M. Gilbert, J. B. Overton with Dr. G. M. Smith now of Stanford University, California, are joint authors of one of the most widely used of the modern elementary botany texts It has recently appeared in a revised edition.

The herbarium which is directly connected with the botany department has been developed under the direction of Dr. J. J. Davis, curator. His chief interest has been in the parasitic fungi of which he has assembled a very large collection of both the Wisconsin forms and exchanges from various parts of the world. Although primarily interested in the parasitic fungi, Dr. Davis has built up a collection of higher plants, numbering 200,000 sheets, which is one of the best of the middle western plants. The recent acquisition of the L. M. Umbach herbarium has greatly strengthened the Wisconsin collection.

Economic Entomology

Under the able direction of Prof. H. F. Wilson, the research facilities of the department of Economic Entomology have been greatly extended during the past ten years. Equipment is now available for any type of entomological study. This, together with the training required of students in the basic sciences and those closely allied with entomology, and the cooperation offered by these departments, has made possible investigations outside of the field of the entomologist of a decade ago.

The physical plant covers more than an acre of ground and consists of a frame building housing the offices of the department and the station of the Bureau of Entomology, an adjoining greenhouse 70x22 feet, a large insectary and an apiary of 85 colonies.

In the office building a good workable insect collection is available, fulfilling the desires for taxonomic work, and a departmental library is maintained. Here also are situated a laboratory replete with the finest equipment for the study of insect histology and newly acquired apparatus for physiological research, a photographic laboratory and dark room with a new 5x7 upright camera and a laboratory for chemical and bacteriological investigations. Three constant temperature chambers, cooled with Frigidaire units, are under construction in the basement to be used in studying the wintering of bees at low temperatures. In one of these cabinets, Mr. Bronson will study the influence of temperature and humidity on the toxicity of insecticides to the striped cucumber beetle.

In the greenhouse, ten colonies of bees are kept throughout the winter for classwork, disease studies, and the artificial insemination of queen bees. The importance of pollen in relation to brood rearing is being studied by Mr. Roe. A series of aquaria are maintained for the study of aquatic insects which abound in the springs about our lakes. Ample bench room is available for those continuing greenhouse studies throughout the winter.

The majority of the apparatus employed in honey production, as well as the bee cellar, is housed in the old Soils Building, where space has been provided to accommodate the large lecture and laboratory classes of the department. A recent acquisition in this building is a special research laboratory in which Prof. Wilson and Mr. Marvin are continuing their studies of the yeasts associated with the fermentation of honey. Samples of honey from all over the world have been received for these investigations.

The Miller Memorial Library, representing the largest and finest collection of bee literature in the world, is a recent departmental addition. It consists of 2500 serial volumes of bee journals from all parts of the world and approximately 2000 books and pamphlets on the subject of apiculture. There are 125 current journals coming regularly for this library, which is to be housed in a special room in the new addition to Agricultural Hall.

Projects largely of an economic nature being conducted at Madison include the studies of Prof. Fluke on the cabbage maggot, the apple maggot and the potato flea beetle, and Mr. Woodworth's investigations on tobacco insects. At the substation at Sturgeon Bay, in charge of Prof. Granovsky, the cherry aphid is being studied. Mr. Griffith, at the substation at Racine, is continuing Dr. Whitcomb's studies of the onion maggot. At the summer field station of the U. S. D. A., in charge of Mr. Dudley, the control and ecology of the pea aphid is under investigation.

Research in addition to the studies previously mentioned includes the work of Prof. Granovsky on insect transmission of plant diseases and biological control conducted by Dr. Fluke. Physiological investigations with reference to the importance of pollen in the diet of the onion maggot are being made by Mr. Dudley and Mr. Griffith. Mr. Searls is studying the influence of pollen on the reproduction of the striped cucumber beetle. Mr. Gwin is carrying on life history studies of the squash vine borer, while Mr. Roberts is studying the toxicity of some special insecticides to the cabbage maggot. Dr. Weed is investigating the factors influencing wing formation in the pea aphid.

Under the present system of a rigorous curriculum, a senior thesis worthy of publication is required of all students majoring in the department. Facilities for this original research are provided in ample greenhouse space, material and equipment furnished by the department, all of which is augmented by summer employment at one of the field stations.

The Forest Products Laboratory

The Forest Products Laboratory of Madison, Wisconsin, is a part of the research branch of the United States Forest Service. This laboratory—the first of its kind to be established—was established in 1910 for the study of the physical and mechanical properties of wood, its chemistry and pathology, and its manufacture, conversion, and use. The purpose behind the accumulation of knowledge resulting from these studies is the same as the whole purpose of the Forest Service, namely, the maintaining—by growth or conservation—of an adequate timber supply.

Because of the complexity of wood the Forest Products Laboratory is divided into a number of investigative sections specializing on separate phases of the general problem. The technical sections are:

Timber Mechanics—Strength and other properties of wood; improvements in design and practice, with J. A. Newlin in charge.

Wood Technology—The relation of structure to properties; identification of wood; relation of growth conditions to composition and properties; relation of growth conditions to resin production, with A. Koehler in charge.

Timber Physics—Experimental and applied kiln drying and air seasoning; moisture control practice and use requirements, with R. Thelen in charge.

Wood Preservation—Gluing, finishing and moisture resistance; fire proofing; pressure processes for wood preservation and non-pressure processes; service records, with G. M. Hunt in charge.

Pulp and Paper—Manufacturing methods and suitability of various woods for pulp, paper, and special products, with C. C. Heritage in charge.

Derived Products—Movement of liquids in wood; chemistry of wood preservatives; chemistry of wood including hydrolysis and extractives; with L. F. Hawley in charge.

Industrial Investigations—Methods and practices in the lumber and other wood using industries, grades, specifications and mill scale studies, with C. V. Sweet in charge.

Pathology—(In cooperation with the Bureau of Plant Industry.) Decay of timber, molds, stains in manufactured wood products and antiseptic properties of wood preservatives, with C. A. Richards acting in charge.

In addition there is a section of Laboratory Operation which handles the administrative work involved in Accounting, Engineering, Photography, Computing, Records, Supplies, and the maintenance of the Laboratory generally.

The section of Publication of Results reviews and coordinates the results secured, prepares material for publication, and in other ways arranges for its most effective dissemination and utilization.

Genetics

The Department of Genetics at the University of Wisconsin includes among its research projects studies in pure genetics and in practical animal and plant breeding. Dr. L. J. Cole, chairman of the Department, has direct supervision of animal investigation; the plant work is being directed by Dr. R. A. Brink, associate professor in the Department. Seventeen graduate students, coming from all sections of the United States and from Canada, New Zealand, India and the Philippine Islands, are doing major work in genetics this year.

Projects actually being investigated by members of the Genetics Department at present include studies upon color, variations in hair pattern, and hereditary influences upon sex ratio in guinea pigs, crossbreeding and inbreeding in cattle, crossbreeding of Brahma and Sebright Bantam breeds of poultry, hybridization work in doves and pigeons, inheritance of color, feather structure, and linkage relations in pigeons, inheritance of resistance to infectious abortion in animals, factors affecting quality in pork, physiology of reproduction, genetics of resistance to wilt in flax, wilt in peas, and disease in beans and onions, occurrence and genetic behavior of rogues in peas, inbreeding in alfalfa and sweet clover, inheritance of resistance to root rot in corn, linkage relations in corn, and effects of inbreeding and crossbreeding in corn.

Obviously equipment and facilities adequate for investigation of the above projects is extensive. A spacious barn, given over entirely to the Genetics Department, houses the cattle, guinea pigs, and rabbits, while pigeon and dove lofts and poultry equipment are portions of the same building. All the students desiring it are provided with space in greenhouses for plant work, also the plant breeding plots located near the University campus, and fields lying farther out are adequate for the extensive research done by students and staff members of the Department.

A quite complete departmental library is readily accessible to all students. Office equipment is such that individual desks are provided all graduate students. A laboratory with ample facilities for both chemical and microscopical studies is maintained for research. For laboratory instruction stocks of *Drosophila melanogaster* are used. Biometrical studies are greatly facilitated by the calculating machines kept for student use.

Horticulture

The Department of Horticulture is housed in a comparatively new and modern two story building on the Agricultural College Campus. To the rear of this building are located the department's greenhouses and a potting house, which form a separate unit. Flower gardens, hot beds and cold frames, vegetable gardens for student practice, tobacco plots and an apple nursery are located on grounds adjacent to the building and greenhouses. Apple, plum and cherry orchards, an apple nursery, an apple orchard for student practice, experimental gardens, a planting of small fruits, a vineyard and experimental tobacco fields are located on the University farms.

Very few courses are given in Horticulture that carry credit toward graduate degrees. Graduate students in this department take their class work almost entirely in the related sciences, such as Chemistry, Genetics and various phases of Botany, correlating these studies with Horticulture in seminary discussions and applying them to research problems in Horticulture. Graduate problems are undertaken in floriculture, landscape and vegetable gardening, tobacco and pomology.

The principal research at the present time is being carried on in the pomology and tobacco divisions. The work in pomology is largely physiological. Some recent publications have been on the responses of trees to pruning. At present the pomological investigations may be divided into two groups; physiological responses, and nursery problems. Under physiological responses may be listed experiments on the response of trees to the presence and absence of nitrogen, to girdling, shading and differences in photoperiod. The nursery problems are concerned with root and scion source and with the relation of stock and scion as affecting vigor, character of root growth, character, rate and period of top growth. Graduate problems are being conducted on apple physiology and on nursery problems.

The work on tobacco may be divided into three main groups: tobacco disease investigations, tobacco breeding experiments and soils and fertilizer studies. In tobacco disease work special emphasis has been placed on the mosaic disease, particularly in regard to cause and control. The breeding work is chiefly concerned with the development of disease resistant strains and the improvement of earliness and quality. The third phase, that of soils and fertilizers, is particularly in relation to the influence of the preceding crop. Work has also been done in the tobacco division on the virus diseases of potato in regard to the relation of environment to the expression of symptoms, and in regard to determining the properties of viruses with relation to their classification. Graduate research work on tobacco is being conducted in all three phases. The tobacco division is in cooperation with the United States Department of Agriculture.

Research work in vegetable gardening is being started and at present consists largely of soil, variety and culture experiments. Graduate research in vegetable physiology is being conducted on the responses of herbaceous plants to the presence or absence of nitrogen, acidity and alkalinity and to differences in photoperiod.

Some research work is being done in landscape gardening with reference to landscape art. The Outdoor Advertising Association has made possible a commercial graduate fellowship for studies on the standardization and beautification of outdoor advertising.

Lake Studies

For a number of years the Natural History Survey has been interested in the productivity of Wisconsin Lakes. The Survey is attempting to do for aquiculture what soil chemists and biologists have done for agriculture. The investigation as carried on at the present time involve the following quantitative determinations: the dissolved gases, various forms of inorganic nitrogen, organic nitrogen, total phosphorus, dissolved phosphorus, silica, hydrogen-ion, turbidity, temperature, plankton, dissolved organic matter and organic matter in the plankton. In some cases complete mineral analyses of the water have been made. The object of all of these quantitative determinations is to determine which factor or group of factors limits the productivity of the lakes.

These investigations are in charge of Dr. E. A. Birge and Prof. Chancey Juday and are carried on in connection with the Department of Zoology of the University, and the U. S. Bureau of Fisheries.

Most of the field work is done during the summer. For this purpose a limnological laboratory has been established on Trout Lake. During the past summer a staff of ten graduate chemists and biologists were engaged on the lake survey. About 325 lakes were visited.

In coöperation with this Survey, the State Laboratory of Hygiene and the City of Madison, Dr. B. Domogalla and Mr. J. Mackin are making a biochemical study of the lakes about Madison and the effect that the effluents from different sewage disposal plants have on the flora and fauna of these lakes and rivers. They are also developing widely used practical chemical methods of treatment for the removal of obnoxious algae scums and rooted water weed growths.

Medical School

Few of the graduate students in our medical departments become members of Phi Sigma. Our two honorary medical fraternities, Sigma Sigma and Alpha Omega Alpha, together with the University of Wisconsin Medical Society, seem to meet their needs adequately. However, an occasional member, usually a candidate for the Ph.D. degree, is drawn from some of our fundamental science departments. Phi Sigma's relation to our medical school is, nevertheless, much closer than this would indicate. A great many graduate students in the Letters and Science and the Agricultural Colleges minor in some medical department, especially in physiology and anatomy. Also many transfer during their graduate years to the medical course, or to some of the fundamental medical science departments. A few have become members of our teaching and research staff. Unusually cordial relations and cooperative spirit exist between the medical departments and the other biological departments of the university from the standpoint of research. Consequently there have been and are many research enterprises carried on here which bridge both as to personnel and equipment, the artificial space officially existent between them.

The general lines of research which are being developed in our fundamental science departments are as follows:

Physiological Chemistry—Profs. Bradley and Witzemann—autolysis; digestive enzymes; catalytic agents.

Physiology—Profs. Meek, Eyster, and Dawson—cardio vascular physiology; relation of exercise to circulation and respiration.

Anatomy—Profs. Sullivan, Bast, Geist, and Mossman—comparative anatomy of the primates (for which material we are largely indebted to the Madison Zoo and the cooperation of Superintendent Winklemann); X-ray technic and the effect of various introduced opaque media upon the body; bone growth and repair; development and ossification of the internal ear; the placenta and fetal membranes.

Bacteriology and Pathology—Profs. Bunting, Clark, Cromwell—development of blood cells; non-specific immunity; quantitative relations of precipitins to their antigens; effect of the precipitin reaction upon eucocytes; the placental transmission of antigens and antibodies.

Pharmacology and Toxicology—Profs. Loevenhart, Tatum, and Muehlberger—trypanocidal and spirochaetocidal drugs with especial reference to African sleeping sickness and neuro-syphilis; physiological oxidation; local anesthetics and their relation to cerebral depressants; chronic intoxications; comparative toxicology of selenium, tellurium and arsenic compounds.

Plant Pathology

The department of Plant Pathology is housed in the two upper stories of the Horticultural Building. To the rear of the building are ten modern greenhouses arranged in series and connected to the Pathelogium, a one story brick building.

The laboratories and greenhouse facilities are especially equipped for the study of environmental relationships between host and parasite. Among the more specialized apparatus installed may be listed the soil temperature control tanks, chambers for the control of air temperature and humidity, as well as constant temperature incubators for cultural work, and chambers especially developed for use in inocculation and incubation of plants under high moisture and various temperatures. Other equipment is unusually complete as such departments go, and this together with the splendid coöperation of the other departments of the University enables one to conduct investigations in almost any field of research.

This department, of which Dr. L. R. Jones is the head, may be said to be composed of two groups of workers, those of the University or State, and those of the U. S. Department of Agriculture detailed to carry on special investigations in cooperation with the department of Plant Pathology at Wisconsin. The problems are not restricted to the Plant Pathology Department, as their very nature demands that other fields of investigation be considered at the same time. A spirit of cooperation exists between the various departments of which the more important may be listed; Genetics, Agronomy, Bacteriology, Horticulture, Botany, Economic Entomology, and Agricultural Chemistry.

The lines of research may be classified roughly into three groups; the investigations of fruit, of vegetable and of cereal diseases, which are headed by Doctors G. W. Keitt, J. C. Walker, and J. G. Dickson respectively. The research staff consists of some 45 of which 27 are graduate students. The dominating theme of the research may be said to be a study of the relation of the environment to disease inception and development. Correlated with this is work upon the physiology of parasitism with critical inquiry into the influence of environment upon the fungus life cycle and infection. A treatise on "The Relation of Environment to Disease in Plants" by L. R. Jones, sets forth briefly the urge for this trend of investigation. The Epidemiology and control of apple scab, cherry leaf spot, fire blight, and crown-gall, the relation of certain environmental factors to the effectiveness of fungicides in the control of apple scab, the application of sprays after inocculation, and fall treatments and phases in the life history of apple scab, fireblight and crown-gall as factors in control, are under consideration as orchard problems.

Investigations on vegetable diseases are being made in relation to homozygosity and physiological relations of cabbage yellows, the toxic effect of fertilizers on clubroot of cabbage and the relation of clubroot to the host, Rhizoctonia of cabbage, leaf mold and canker of tomato, bacterial wilt of alfalfa, mosaic of tobacco and beans, and certain onion and sugar beet troubles.

The cereal disease investigations involve studies of the physiological factors concerned in the winter killing of wheat, of the physiology, cytology, genetic behavior and parasitism of Gibberella saubinetti, the seedling blight of corn, of Pinicillium as a factor in seedling injury of corn, of the black bundle disease of corn, and of the Rhynchosporium disease of cereals.

Soils

The Department of Soils under the chairmanship of Prof. A. R. Whitson is interested in a great variety of research work. A large share of this work is carried on under the direction of Prof. E. Truog. Probably the most outstanding is the investigation which he has carried on in conjunction with Dr. H. W. Kerr and other graduate students relative to the nature of base exchange and soil acidity. Dr. Kerr spent two years on this work and has published one paper and since leaving the United States has continued these studies in Hawaii and the Dutch East Indies. He is now at home in Australia and has a second paper in press. Very recently Prof. Truog and Mr. J. A. Chucka have been able to isolate this base exchange material from the soil and to show that it has the same constants that Dr. Kerr found for it.

With others of his students he is doing a great deal of research work on methods of soil analysis and especially colorimetric and volumetric methods for the estimation of available phosphorus. Mr. Chien Peng, Mr. Jno. Mitchell and Mr. L. M. Weyker have been working with him on these methods.

Besides the general work done in the department with the time and method of application of fertilizers, Mr. A. R. Midgley is working on the movement of phosphorus in soils in pasture fertilization. Two fellowships in fertilizers are handled in the department; Mr. Weyker is working on the factors which govern the availability of lime phosphate and Mr. R. Cowart on the physical effects of sodium nitrate on soils.

A study of the relation of soil acidity to the growth of alfalfa made by Mr. H. D. Chapman is being continued by Mr. H. H. Hull in an attempt to establish the relation of available calcium in this connection. Mr. M. C. Ford is studying the availability of phosphorus on Kentucky soils and Mr. C. V. Ruzek the availability of phosphorus and the base exchange relations of some Oregon soils.

Two pieces of work recently completed in the department are worthy of note in this connection. Dr. R. P. Thomas has worked out some of the fertility factors which affect the occurrence of brown root rot in tobacco and Dr. A. Floyd Heck has just concluded a study of the mineralization of the nitrogen in fungous tissue and some of the factors by which this process is governed. Both of these papers will shortly be published, the former in the Journal of American Society of Agronomy and the latter in Soil Science.

Zoology

The Zoology Department occupies the eastern half of the Biology Building, a large five story stone structure near the summit of University Hill. In its lecture halls and laboratories a beginning class of five hundred students is annually introduced to the science of animal life. Advanced courses, graduate work and research by students and instructors have a big share in the busy life in the building.

Among the subjects under active investigation at the present time, the following may be mentioned: the physics, chemistry and biology of Wisconsin lakes, the physiology and chemistry of the sex hormones, bird banding, host-parasite relations of ascarid worms, embryology of the trout, antibodies in relation to heredity, insect embryology, cytological problems relating to Golgi bodies and cancer cells, taxonomy of the ciliates, and a number of other problems.

A large vivarium is connected with the building in the rear. An excellent departmental library is housed on the fourth floor. A lake-shore laboratory with boats and collecting equipment is maintained on Lake Mendota for ecological and limnological work. Further facilities worthy of mention are dark rooms, constant temperature chambers, workshop, chemical storeroom, chart room, fish tanks, injecting room, operating room, and fully equipped biochemical laboratory.

The departmental staff includes one president emeritus, two professors, two associate professors, two assistant professors, one lecturer, three instructors, two teaching fellows and sixteen assistants, besides departmental technician, stenographer, animal caretakers and store room attendants.

Each year from two to five Ph.D. degrees are granted in the department and usually between five and ten Master's degrees. About twenty senior majors are graduated annually.

Programs and Activities

Zeta Chapter of Phi Sigma holds regular meetings every two weeks on Thursday evenings, in Room 301 of the Biology Building. Besides being fitted with the necessary lecture room furnishings, this room is equipped with a projection lantern for illustrating talks, and most of the papers and talks given before the chapter are illustrated.

The programs are diversified in nature, which is responsible in some degree for the splendid attendance upon the meetings by the membership. In addition to the regular meetings, special programs and lectures are arranged and sponsered by the chapter. These generally take the nature of all-university lectures, open to the university students and faculty and the public, and are held in one of the larger auditoriums of the campus.

During the 1927-28 session, the following special and outstanding lecture programs were sponsered by Zeta Chapter:

Oct. 27—Dr. Louis Kahlengerg—Department of Chemistry, University of Wisconsin. Subject: Where Biology and Chemistry Meet.

Jan. 27—Dr. Arthur C. Pillsbury—Formerly Official Photographer of Yosemite National Park. Subject: The Opening and Closing of Flowers and the Movements of Plants. This lecture was illustrated by movie films.

Apr. 13—Dr. Willis Rich—U. S. Bureau of Fisheries—and Dr. George Kemmerer, University of Wisconsin Department of Chemistry—in a combined lecture. Subject: The Red Salmon of Karluk and Kodiak Islands, Alaska. This lecture was illustrated by movie films.

Apr. 26—Dr. A. S. Pearse—Department of Zoology, Duke University. Subject: Nigeria and the Conquest of the Tropics.

In addition to the regular semi-monthly meetings, the chapter holds two regular initiation banquets, one in the fall and the other in the spring. The banquet speaker for the fall initiation is usually the faculty member elected for the current year to honorary membership into the society, while the speaker at the spring initiation banquet may be someone outside the membership circles of Phi Sigma.

For the year 1927-28 Dr. L. J. Cole, Head of the Department of Genetics, was the honorary member elect and was the speaker at the fall banquet.

His subject being "The Growth of a Science". At the spring banquet the address was given by President Glenn Frank of the University of Wisconsin. President Frank spoke on the responsibilities of the biologist in pointing the way to a superior humanity.

Where Zeta Chapter Men are Now Located

Carter M. Harrison is continuing his graduate studies in the Department of Botany at the University of Chicago.

Paul E. Tilford has returned to his position with the Ohio Agricultural Experiment Station, Wooster, Ohio.

Warren Whitcomb, since completing his work for the Ph.D. degree in June, has accepted a position as Government Entomologist, in charge of the Southern Apiculturial Laboratory at Baton Rouge, La.

Herbert R. Angell, Ph.D. in June, has been engaged as Extension Plant Pathologist for the Virginia Polytechnic Institute, with headquarters at Blacksburg, Virginia.

T. J. Fjardo is instructing in Plant Pathology at the Oregon State Agricultural College, Corvallis, Oregon.

A. I. Weinstein, Ph.D., spent this summer at Sturgeon Bay, Wisconsin, but is now on the west coast.

J. Sinclair, Ph.D. in June, is Professor of Anatomy in the Medical School of the University of Texas, Galveston, Texas.

H. J. Snider has returned to his position in the Soils Department of the University of Illinois.

M. Manresa completed his Ph.D. work in June and has returned to the Veterinary Department of the University of the Philippines.

Wesley T. Pomerenke, Ph.D., is completing his medical course at the Harvard Medical School.

Glenn H. Stringfield has resumed his duties as Plant Breeder at the Ohio Agricultural Experiment Station, Wooster, Ohio.

E. J. Wimmer, Ph.D. in June, is instructing in Physiology at the Kansas State Agricultural College, Manhattan, Kansas.

C. K. Weichert, Ph.D. in June, is with the Zoology Department of the University of Cincinnati, instructing in Embryology and Comparative Anatomy.

A. S. Dahl is doing research work in the Department of Plant Pathology of the University of Minnesota, University Farm, St. Paul, Minn.

Stillman Wright, Ph.D. in June, is with the Bureau of Fisheries and is located at Sandusky, Ohio, on Lake Erie.

Henry Lowsma is instructing in Chemistry at the Kemper Military Academy, Missouri.

Sam Basherov is Head of the Department of Animal Husbandry in the College of Agriculture of the University of Porto Rico, and is located at Mayaguez, Porto Rico.

George O. Cooper, Ph.D. in June, is studying at the Kew Botanical Gardens, England.

Oliver Orton of Iota Chapter has come to Wisconsin to continue his graduate studies on Fungi under Dr. E. M. Gilbert.

A. Wiebe has returned to Wisconsin to resume his studies on lake life. He has been with the Iowa Bureau of Fisheries for the past several years.

Hugh Stiles has returned to complete his work for the Ph.D. degree. He has been working with the Commercial Solvent Corporation.

Norman Cameron has resumed his duties on the staff and is continuing his research studies on animal behavior.

DR. JOSEPH E. KIRKWOOD

The death of Joseph E. Kirkwood, chairman of the department of Botany of the Montana State University, on August 15, 1928, was a sudden and tragic blow to those who knew him and his works. It marked the end of a brilliant and successful career. He had been working at the Biological Station on Flathead Lake, and was just preparing for a trip to California to spend his sabbatical leave of absence when death's untimely summons came.

He was a very capable administrator and the present size and strength of the botany department is a record of his successfulness. He came to Montana in 1909 as a professor of botany and forestry, directing all forestry work until the School of Forestry was organized in 1914, at which time he became chairman of the botany department. He was responsible for much of the success of the forestry school.

From the tributes given him by friends, one learns of the high esteem in which he was held. He was a man of high scholarship, honesty and purpose, and of unflinching courage. He has won a commanding position in the field of botany.

In considering Dr. Kirkwood's contributions to botany, the results of his field work must be remembered. These are evidenced by his building up of the herbarium and the additions from regions hitherto unexplored botanically. He collected a great number of species, and also took very accurate field notes on every species collected.

During his 18 years of service he served on twelve administrative committees of great variety. His enthusiasm for all research was great. He was a fellow of the A. A. A. S. and a member of the Botanical Society of

America, the Ecological Society of America, the American Association of University Professors, Torrey Botanical Club, Northwest Scientific Association, Inland Empire Teachers' Association, Sigma Xi, and Phi Sigma.

The list of Dr. Kirkwood's scientific publications is long. They present the results of his research in field and laboratory and are remarkable not only for their scientific accuracy but for the fact that the illustrations are the work of the author and reveal artistic ability of which not many of his acquaintances were aware. The drawings are unusual in their detail. Also the list includes many magazine articles designed to popularize the study of botany and contributions to educational publications containing suggestions as to the teaching of science.

Of major importance is the volume published in 1922, ''Forest Distribution of the Northern Rockies''. The book received fine recognition in forestry and botanical circles. Another important work is his ''Trees and Shrubs of the Northern Rockies''. This is in manuscript form, ready for publication and it is proposed that the State University shall publish this as a memorial volume. It is also illustrated by the author's drawings.

Dr. Kirkwood had great respect for the student who tried. He strongly encouraged precision and accuracy and exemplified them himself. His work was characterized by rigidity, high standards, intellectual energy and independence. These qualities made him a respected and an exemplary man to everyone.

Faye Couey.

(The writer is indebted to Professor J. W. Severy of the Botany Department of the University of Montana, for much of the material in this article.)

Due to unavoidable delays concomitant with the change in editorship of The Biologist, this number is late in appearing.

I wish to extend my sincere thanks to Dr. Cutler and Mr. Milligan, Denver, Colorado, for kindly reading all proofs for this issue as this assisted very materially in speeding up actual publication.

I also wish to thank Dr. E. F. Davis for helping in many ways, and for having part of the material for this number ready for my use.

A. I. O.

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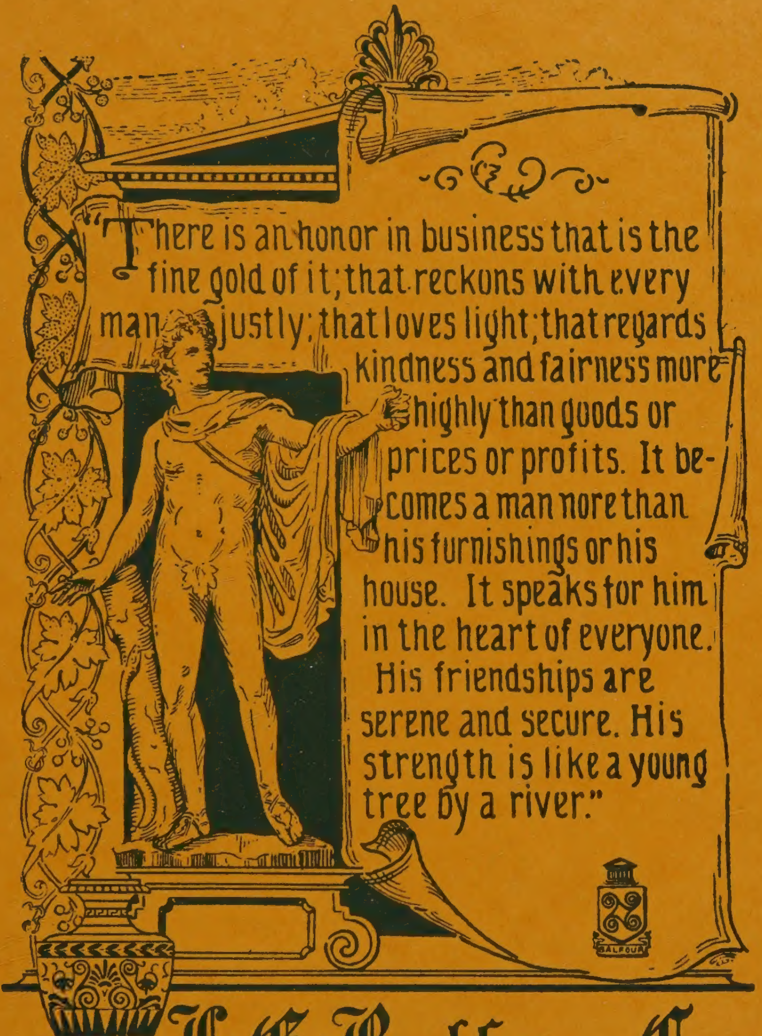

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